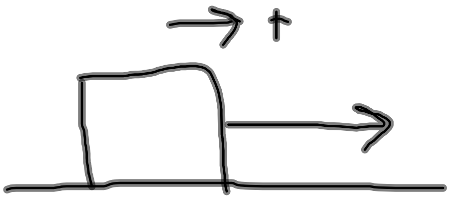


$\mu_k = 0.25$

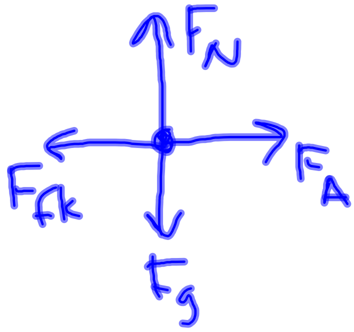
$m = 20\ kg$

$F_A = +100\ N$

$d = +2\ m$

find W_{net}

$\vec{F_A}$ →, $\vec{d}$ → $\theta_A = 0°$



$\vec{F}_{fk}$ ←, $\vec{d}$ → $\theta_f = 180°$

$$W_{net} = W_A + W_f$$
$$= F_A d \cos\theta_A + F_{fk} d \cos\theta_f$$
$$= (100\ N)(2\ m)(1) + (49\ N)(2\ m)(-1)$$
$$= 102\ J$$

$$F_{fk} = \mu_k F_N$$
$$= (.25)(196\ N)$$
$$= 49\ N$$

$$\Sigma \vec{F}_y = 0$$
$$F_N - F_g = 0$$
$$F_N = F_g$$
$$= m a_g$$
$$= (20\ kg)(9.8\ m/s^2)$$
$$= 196\ N$$

A worker pushes a 1500 N crate with a horizontal force of 345 N a distance of 24.0 m. Assume the coefficient of kinetic friction between the crate and the floor is 0.220.

a) How much work is done by the worker on the crate?
b) How much work is done by the floor on the crate?
c) What is the net work done on the crate?

$F_N = F_g = 1500\ N$

$\rightarrow F_A = 345\ N$

24 m

$\mu_k = 0.22 \quad F_{fk} = \mu_k F_N = (.22)(1500\ N) = 330\ N$

$\vec{F}_A \quad \vec{d} \quad \theta = 0°$

a) $W_A = F_A\, d \cos\theta_A$

$= (345\ N)(24\ m)(1)$

$= 8280\ J$

$\vec{F}_{fk} \quad \vec{d} \quad \theta_f = 180°$

b) $W_f = F_{fk}\, d \cos\theta_f$

$= (330\ N)(24\ m)\cos(180°)$ -1

$= -7920\ J$

c) $W_{net} = W_A + W_f$

$= 8280\ J - 7920\ J$

$= 360\ J$

HW:

p. 162: 1, 2

p. 166: 3, 4

Types of Energy and Examples:

Mechanical	moving a lever or pulley
Chemical	battery
Nuclear	core of Sun
Electromagnetic	electric or magnets
Thermal	heat produced from friction

Mechanical Energy:

- Kinetic Energy:
  - $K = \frac{1}{2} m v^2$
    - v → magnitude of velocity (scalar)
    - m → mass (scalar)
    - K → kinetic energy (Scalar)
  - Energy associate with a moving object
- Gravitational Potential Energy
  - Energy associated with difference in height from zero point
  - $U_g = m a_g \Delta h$
- Units of both: Joules
- Total Mechanical energy:

$$E_{total} = \Delta K + \Delta U_g$$

$$= (K_f - K_i) + (U_{gf} - U_{gi})$$

Relationship Between Work and Energy:

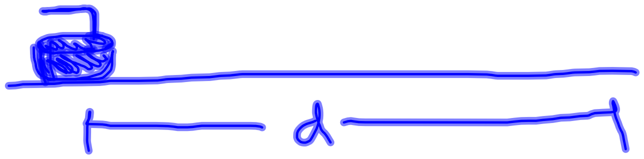
- Work-Energy Theorem
  - Takes energy to do work
  - $W = \Delta E$

    $= \Delta K + \Delta U_g$

On a frozen pond, a person slides a 10.0 kg curling stone, giving it an initial speed of 2.2 m/s. How far does the curling stone move if the coefficient of kinetic friction between the curling stone and the ice is 0.10?

$v_i = 2.2$ m/s $v_f = 0$ m/s $\mu_k = 0.10$ F_{fk}

$m = 10$ kg



$$W = (K_f - K_i) + (U_{gf} - U_{gi}) \quad (U_{gf} - U_{gi} \to 0)$$

$$F_{fk}\, d \cos\theta_f = \tfrac{1}{2} m v_f^2 - \tfrac{1}{2} m v_i^2 \quad (\tfrac{1}{2} m v_f^2 \to 0)$$

$$d = \frac{-m v_i^2}{2 F_{fk} \cos\theta_f} \quad (\cos\theta_f \to -1)$$

$\theta_f = 180°$

$$= \frac{+(10\text{ kg})(2.2\text{ m/s})^2}{+2(9.8\text{ N})}$$

$$= 2.47\text{ m}$$

$F_{fk} = \mu_k F_N$

$= (0.1)(98\text{ N})$

$= 9.8\text{ N}$